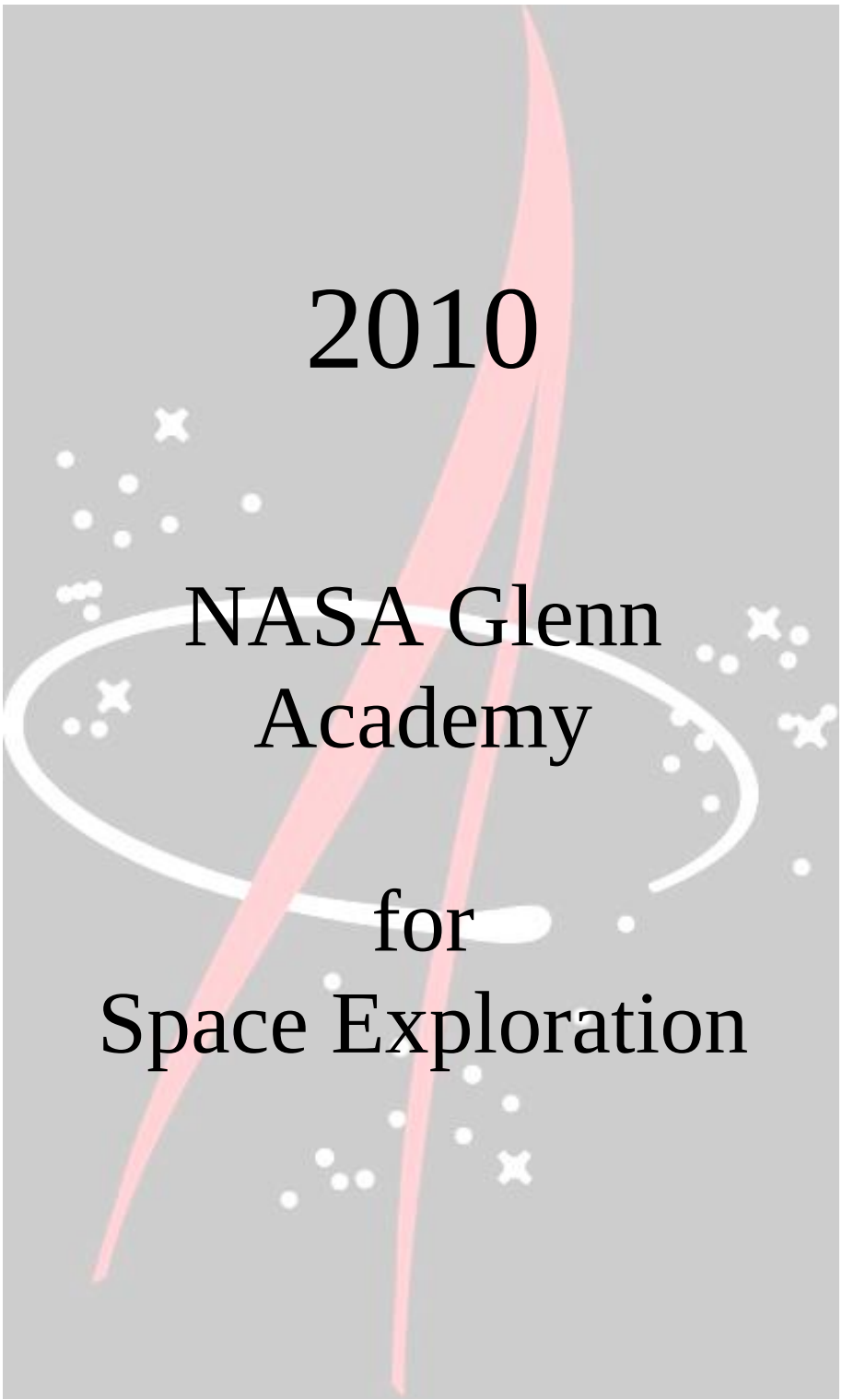
National Aeronautics and Space Administration



2010

NASA Glenn Academy

for Space Exploration

A Message From the Center Director

Ramon Lugo III

Director, NASA Glenn Research Center

New Horizons:

The Glenn Research Center drives the engine of innovation. The Center's expertise continues to be critical to NASA's future missions in air and space. As private and commercial aviation expands, NASA Glenn will propel aircraft to new standards of performance and efficiency. With a new vision for exploring our solar system, NASA Glenn engineers and scientists are ready to pursue breakthrough technologies in advanced power, propulsion and communications to enable human and robotic missions to the Moon and beyond.

(From "The Glenn Research Center: Expanding Horizons and Opening Frontiers", NASA Fact Sheet FS-2004-08-009-GRC.)

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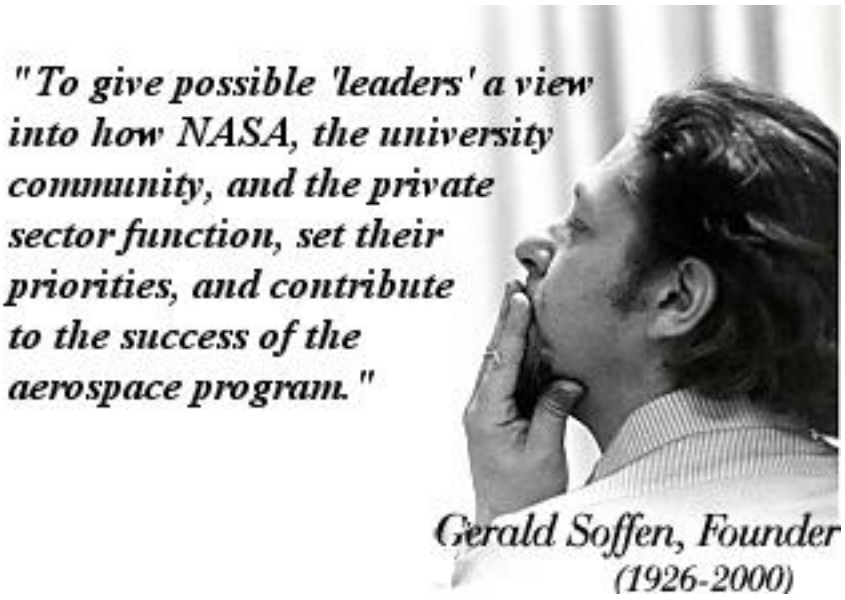
A Brief History of the NASA Academy Program



The NASA Academy was founded in 1993 as the "NASA Space Academy" at Goddard Space Flight Center by Gerald (Jerry) Soffen, former Mars Viking project scientist, architect of the NASA Astrobiology program, and first Director of the Goddard Office of University Programs. Jerry was an accomplished scientist and a dedicated educator. He took advantage of the unusual opportunities presented to him during his career and realized the importance of mentoring in the life of young professionals. In his vision, the Academy was intended to exceed in purpose and content all the other regular internships by familiarizing its participants with as many facets of NASA as possible. With his dynamic personality and unique leadership, he opened many gateways and defined a new standard of excellence.

NASA Academy programs were established later at the Marshall Space Flight Center (1994), the Ames Research Center (1997), the Dryden Flight Research Center (1997), and the Glenn Research Center (2005). In 2010, Ames, Glenn, Goddard, and Marshall will host Academies.

Jerry Soffen died on November 22, 2000. We honor his legacy by continuing the Academy program that he loved so well.

In 2010, the NASA Academy celebrates eighteen years of operation. So far, more than 700 participants have graduated from the program.

Program Description

The NASA Academy for Space Exploration is an intensive resident summer insitute of higher learning designed to guide the future leaders of the United States space programs by exposing them to many facets of NASA and other sectors of the aerospace industry. This unique and prestigious internship program is designed for talented college upper-level undergraduate students and graduate students interested in pursuing professional and leadership careers in space-related fields.

The NASA Academy program is designed to present a broad picture of the organization of the NASA agency, and some of its most important current and planned science, engineering, education, and technology enterprises. Additionally, it presents a number of non-technical areas of critical significance, such as management, budgeting, safety, personnel and career development, leadership, space law, and international cooperation Students conduct supervised research in GRC laboratories, attend lectures and workshops, and participate in visits to other NASA Centers and space-related laboratories and industries.

NASA Academy provides immersive and integrated multidisciplinary exposure and training for students with various backgrounds and career aspirations. The academic curriculum balances opportunities for direct contact with advanced science and engineering research and development and an awareness of the complex managerial, political, financial, social, and human issues faced by the past, present, and future aerospace programs.

By participating in the NASA Academy program, the students join the NASA Academy Alumni Association (NAAA). The NAAA works to serve both present and past members of the Academy program by promoting communications, fellowship, camaraderie, and an *esprit de corps* among and between all Alumni. Additionally, the NAAA seeks to provide a mechanism to facilitate Alumni participation in programs and projects, both internal and external to the NAAA, that promote NASA and space education, and that communicate the excitement of space exploration and development to the general populace.

Alumni of the program have gone on to become the following (as of 2001):

- Rhodes and Truman Scholars.
- International Space University (ISU) Graduates.
- Test Pilots (Air Force / Navy).
- 70+ pursuing PhD/Masters (many at institutions such as Harvard, MIT, Cal-Tech, Stanford, and Princeton).
- 30+ returned for positions at NASA Installations (JSC, KSC, GSFC, ARC, MSFC)
- Many others work in Industry: Lockheed Martin, Northrop Grumman, Raytheon, Boeing, Space-X, Orbital Sciences…and the list goes on.
- Coming soon: Astronaut (one alumnus is currently in the top levels of the astronaut selection process).

Program Objectives

- To support and enhance the general objectives and mission of NASA.

- To give to the selected students guided access to the extensive and varied resources at the participating NASA Research and Space Flight Centers, and to expose students to the centers' infrastructure, science, technology, and organizational and managerial expertise.

- To provide a unique, intensive, and rigorous educational and training curriculum related to the organization of NASA, its in-house science and technology projects, its collaboration with other National centers, industry, and academia, and its extensive technology transfer programs.

- To facilitate access to, and dissemination of, valuable information on career development paths, financial support, technical writing standards, intellectual property, etc.

- To create an environment that fosters creativity, personal initiative, and leadership qualities, together with group mentality, teamwork, and professional ethics.

Eligibility and Selection Criteria

The eight Research Associates in the 2010 NASA Glenn Academy for Space Exploration have been selected from a very competitive pool of applicants from institutions of higher education both within and outside of the United States. Selection was based following criteria:

- Academic rank (Rising Junior undergraduate through rising second-year graduate student).
- Academic performance (Minimum GPA of 3.0 or equivalent).
- Demonstrated interest in the space program.
- Demonstrated leadership qualities.
- Research and/or project interest and experience.
- Letters of recommendation.
- Citizenship is required for US applicants; non-US citizens must apply through their country's space agency.

The selection process and placement of the Academy participants within Glenn's research groups were assisted by recommendations from Academy Alumni, faculty, administrators, academic supervisors, and the applicants' self-profiling essays.

Robyn Bradford

Central State University
Wilberforce, OH
B.S. Manufacturing Engineering, May 2011

NASA Academy Research Project:
BET (Brunauer, Emmett, and Teller) Analysis to Determine Surface Area of Cobalt Catalysts for Use in Fischer-Tropsch Gas-to-Liquid (GTL) Processes

Principal Investigators:
Aloysius Hepp, PhD
Ana De La Ree, PhD

Hometown:
Bellbrook, OH

EMAIL: robynbradford92@gmail.com

Background

I am a rising senior pursuing my Bachelor of Science degree in manufacturing engineering at Central State University (CSU). On campus, I am an active member of the National Society of Black Engineers (NSBE) and the Society of Manufacturing Engineers (SME) Central State Chapter. I am also a member of Alpha Kappa Mu Honor Society.

Research Experience

I was an undergraduate research assistant for the Consortium Research Fellows Program. I worked with the Air Force Research Lab (AFRL) in the Human Effectiveness Directorate at Wright Patterson Air Force Base in Dayton, Ohio. I assisted with research focusing on analyzing the performance and vulnerabilities of complex networks using mathematical and computer-based models. Other projects included implementing brown bag seminars focused on nonlinear science and signal processing applications.

Research Interests

I've been conducting independent research on protein crystallization for the past two and a half years with my chemistry professor. The objective is to investigate the effects of pH and protein concentration on the process of crystallization in an effort to develop a reliable, yet economical protocol for growing large, high-quality protein crystals. We have already identified optimal conditions for protein crystal growth and are now in the process of designing and implementing experiments to test whether crystals will grow consistently.

Other Internship Experience

I have also interned with The Boeing Company in Seattle, Washington. I worked in the Production Engineering Department for the Composite Manufacturing Center. As a manufacturing engineering intern, I updated manufacturing process guides (MPGs), which are detailed instruction manuals for specific processes, and assisted engineers with work process improvements.

Professional Objectives

After graduation, I will attend graduate school to obtain my master's and PhD degrees in materials engineering. I plan to research and discover innovative ways to meet the materials needs of industry. Like others who have guided me on this journey, I plan to mentor and inspire young people to identify their passions and pursue them.

Leadership

Last year I served as the Mentor Coordinator for the community outreach program Future Latinos in Engineering, sponsored by the Ohio Commission on Hispanic/Latino Affairs (OCHLA) and hosted by CSU. I volunteered for this position because I have been blessed with phenomenal mentors in my own life and wanted to help others in the same manner. The objective of the OCHLA program is to encourage middle to high school Hispanic/Latino students to explore science and engineering. My job was to lead 6 CSU students to serve as mentors for 12 middle and high school students; and to serve as a liaison for local professionals participating in the program.

I scheduled meetings, tracked the projects the students worked on, and supplied materials. I kept expenditures under budget and provided receipts and reports of monies spent. I also assisted the mentor/mentee teams with preparing posters for presentation day. In addition, I handled any problems that arose and provided transportation when needed for mentors to meet with their mentees. Of course, none of this would have been possible without the support of my team; and fostering a commitment to the shared goal of helping younger students. The highlight of the program was the Future Latinos in Engineering Fair. This event showcased the engineering projects the mentees worked on and what they learned. State representatives and local professionals, including engineers and teachers, were also in attendance.

Acknowledgements

I would like to thank my professors Dr. Joe Ross, Dr. Victor Aimiuwu, and Dr. Abayomi Ajayi-Majebi for their encouragement and support. I also wish to thank the Ohio Aerospace Institute, the Ohio Space Grant Consortium, NASA Academy, Mr. Gerald Noel, Col. Clark Fuller, Dr. Juliette Bell, John W. Garland, Esq, Mr. Gorgui Ndao, and Mr. Morakinyo Kuti.

Milwaukee School of Engineering
Milwaukee, WI
B.S. Mechanical Engineering
Minor in Mathematics

University of Wisconsin-Madison
Madison, WI
M.S. Mechanical Engineering, Dec 2010
Focus in Biomechanics

NASA Academy Research Project:
Life Support Systems/Particulate Matter and Lunar Dust Filtration

Principle Investigator:
Dr Juan H. Agui

Hometown:
Stevens Point, WI

EMAIL: jelinskc@msoe.edu

Philosophy

NASA's mission is to pioneer the future in space exploration, scientific discovery and aeronautics research. As pioneers, it is critical to be at the forefront of technology in these areas by using the science, technology, and engineering talent we have right within our own country. Furthermore, it is essential to re-inspire young children in these areas, so that NASA can be carried though to the next generation leading us to the development of amazing new technologies and to worlds beyond our own.

As a young child, I was inspired by astronauts of the time, and dreamed that someday I too, might make it into space. I remember asking for chemistry sets, rock collections, and telescopes as a child. These dreams drove me toward studying science and math, so that I might be able to understand the world around me. After high school I chose to pursue engineering as my way towards space.

I realize now, my chances of making it to the moon or to Mars are very small, but I hope that by becoming an engineer, I can work toward that dream, towards NASA's mission to advance scientific discovery and space exploration, so that generations after mine may realize those dreams too. I believe that scientists and engineers have the responsibility to continue NASA's legacy so that it is at the forefront of technology and research for the future.

Research Experience

Extracurricular projects and research has been an integral part of my life from high school through college and into my master's program, and has crossed a wide range of research areas.

In high school I worked in the biology lab and green house at the University of Wisconsin – Stevens Point helping to develop hybrid potato plants that were resistant to specific diseases and insects. This research set the foundation for my interest in engineering research.

As an undergraduate, I pursued research through two different organizations: The Wisconsin Space Grant Consortium (WSGC) and The Fluid Power Institute (FPI). Though the WSGC, I was involved in three separate projects. The first project was individual research funded through NASA on *High and Low Velocity Impacts of Carbon Fiber/Spectra ® Composite Sandwiches*. This research allowed me to study the strength characteristics of the relatively new fiber material for use in space applications. The second project was a group project which involved designing and building three experimental payloads to be launched to 100,000ft on a high altitude balloon. Our team focused on developing a sun-tracking camera system, improving efficiencies of solar cell films, and looking at the different types of ultra-violet levels in the atmosphere. The third project was to design and build a high-power rocket to certain requirements and participate in a competition. The parameters of the competition are different each year. The three years I competed, I was part of teams receiving 2nd place, 1st place, and 1st place consecutively in the engineering bracket.

At the FPI, I was involved in many projects over the course of two years in the areas of hydraulic circuits, fatigue testing, and tribology and contamination. All of these projects were funded by external sources specific to the work being done.

As a graduate student, I have worked on a research proposal based on using high and low frequency electrical stimulation to reduce muscle atrophy due to microgravity. In the fall of 2010, I will be working on an individual research project on a related biomechanical project.

Professional Objectives

I plan to graduate with a master's degree in mechanical engineering in December of 2010. I would love to someday work for NASA performing research in any of a number of different areas. At this point, I might also be interested in obtaining a Ph.D. However, I would first like to start in industry in the area of biomechanics to gain practical experience and help people now.

I do believe, though, that part of the future of NASA is sending humans on long-term missions to distant moons and planets. For this to occur, an important factor is human sustainability. I would love to be a part of a team that helps make this dream come true by using my biomechanics and mechanical engineering background along with the NASA Academy experience.

Adam Harden

Milwaukee School of Engineering
Milwaukee, WI
B.S. Mechanical Engineering, May 2010

Purdue University
West Lafayette, IN
M.S. Aeronautics and Astronautics, May 2012

NASA Academy Research Project:
Cryogenic Propellant Feed System Analysis Tool Development

Principal Investigator:
Dr David Plachta

Hometown:
Dousman, WI

EMAIL: hardena@msoe.edu

Personal Statement

My aspirations to work with the United States space program have been strong since I was very young, watching in awe as the space shuttle lifted off, attending Space Camp, and visiting Kennedy Space Center. Now, years later as a mechanical engineering student poised to begin graduate studies, these aspirations have wavered none. Instead, my broad desire to participate in this country's greatest endeavor, space flight, has been focused by my technical education and professional maturity. Of the multitude of reasons that exist for attending NASA Academy, it is my desire to continue focusing, defining, and clarifying how I might best contribute to the space-faring goals of the United States that I offer as my prime driving motive for applying. In particular, NASA Academy is ideal because it focuses not only on the technical, but also the social, professional, and political aspects of the Agency. Indeed, fully defining my professional goals is significantly more difficult without understanding where NASA is, where it is going, and how it is going to get there. Academy offers me a peak at this while allowing me to pursue a short-duration technical project and significant networking prospects. I want to attend NASA Academy because it is the next logical rung in the ladder that leads to my contributions to United States space exploration.

Professionally, my interests include astrodynamics, space mission design, and trajectory optimization. I will be attending graduate school in the autumn of 2010 to pursue a Masters degree in Aerospace Engineering with a particular focus on those fields. My reasons for selecting astrodynamics as a field of study stem primarily from a course

in numerical methods and simulation I completed my junior year. The course project, the development of a numerical model describing the flight path of a rocket, was key to sparking my interest in astrodynamics. I was truly enthralled by my ability to predict accurately the flight path of the vehicle. Developing higher and higher fidelity models ceased to be work and instead became an exciting challenge. The completion of the course found me applying the same numerical techniques to an interplanetary spacecraft and it did not take long to realize I had perhaps found my professional calling.

I have additionally enjoyed studying fluid mechanics and aerodynamics. My senior capstone project is the design and development of a ducted radiator for a high performance aircraft, a task which I have enjoyed applying aerodynamic and thermodynamic principles to. In particular, the optimization of diffuser geometry to mitigate pressure losses through the duct is a fascinating problem I have enjoyed thus far.

I see in my future working as a spacecraft dynamics professional developing the mission plans and trajectories that will carry science equipment and humanity beyond low earth orbit. My prior experience at JPL lends itself well to returning in the future as a member of the Lab's guidance and navigation groups. I am also interested in other NASA Centers, particularly as the United States begins its return to the moon. Ultimately, after completing graduate school I desire to work with the National Aeronautics and Space Administration or a major contractor thereof. I would like more than anything else to be part of making spaceflight beyond Earth orbit not only a reality again, but hopefully a permanent, common occurrence for humanity.

Leadership

This year I am serving as a team leader competing in the Wisconsin Space Grant Consortium's Collegiate Rocketry Design Competition. My team and I are responsible for developing a high-powered rocket capable of carrying the greatest mass to a specified altitude. As a year-long project, I have the opportunity to demonstrate leadership over a technical effort from conception to fabrication.

As the project is currently in the early stages, one avenue through which I have exhibited leadership is promoting the collaborative development of the team's budget. Such a document is critical in a less formal design environment such as this, as the preliminary design tends to be reflected by those components called out on the budget. I have helped steer the team through this initial phase by encouraging frank discussion regarding basic technical decisions such as material selection and the geometry of specific components. The team effort is currently under budget and on schedule.

I expect to shortly be leading the team through a more complete design phase that includes solid modeling and dynamics simulation. Besides contributing to the technical tasks, my role as team leader will be to ensure budget margins are not exceeded, competition milestones are met, and a simplicity principle is adhered to throughout the design and fabrication efforts. These are not single event manifestations of leadership but instead overarching principles which I have thus far met and will continue to strive for in the future.

Research Interests

Astrodynamics and Fluid Mechanics.

Massachusetts Institute of Technology
Cambridge, MA
B.S. Mechanical Engineering, May 2010

NASA Academy Research Project:
Magnetic Gear Test Rig

Principal Investigator:
Paul Solano

Hometown:
Goodwater, AL

EMAIL: howard.j.liles@gmail.com

Personal Statement:

I am greatly interested in machine design, propulsion systems, and advanced robotics. I am fascinated by new and innovative technology. For example, often times when I see a new mechanical product, such as the souvenirs one finds at career fairs, I simply have to examine it and figure out how it was designed. I particularly enjoy creating mechanical devices, systems, and mechanisms to effectively solve problems or improve upon existing concepts. Furthermore, learning about the new initiatives and projects during my previous research project at NASA Glenn Research Center has intrigued and inspired me. I am very interested in the potential directions that NASA may take to renew its exploration objectives on the moon and outer space. I would be delighted to help take on the challenges of lunar surface exploration, lunar energy production, and propulsion for launch vehicles and deep space exploration.

I have also previously done a little work in industry, having interned for GE Transportation. While this provided me with a very educational experience on the business aspects of engineering, I personally feel that my interests lie more along the research side of engineering. In some of my undergraduate classes at MIT, I have had the opportunity to design and build a mechanical system to accomplish a particular goal. I took great pleasure in this task and was able to exercise and develop my critical thinking, solid modeling skills, and foresight in the design process. Most specifically, I enjoy the problem solving and designing process that one undergoes to meet technological goals. I love the challenge of combining my engineering knowledge, intuition, and creativity while working with others to develop and produce conceptual designs.

Based upon what I gained from these experiences, my goals are now to eventually work in research and development for either NASA, the U.S. government, or other companies such as GE Global Research that are particularly relevant to my fields of interest. I anticipate that by participating in the NASA Academy Program, I will be able

to explore how my interests connect and apply to real-world research. Hopefully, this will provide me with further insight into the world of cutting-edge research and development and will allow me to better shape my future career plans.

Background

I feel that my unique background experiences have prepared me for the challenging and perplexing field of research. Having grown up in rural Alabama I was exposed to a lot of basic agrarian tools and technology. I used chain saws, axes, machetes, and splitting mauls to perform farm tasks and cut firewood for my grandmother during the winter. While performing these tasks I would constantly problem solve in various scenarios such as: determining the shortest and least troublesome path when wheel-barrowing loads, cutting wood in ways that maximized my mechanical advantage, and in general always looking for ways to save time and work more efficiently. During these experiences, I also learned the value of hard work and determination, both of which are often necessary to complete difficult endeavors. I was exposed to basic shop tools (saws, drill presses, etc.) and automotive machinery while taking the classes Agricultural Sciences and Automotive Technologies at my high school. It was here that I became very familiar with machining and simple manufacturing. I believe that these experiences, which I have further refined at MIT, help give me a very valuable intuition and feel for the basic mechanical engineering processes that come up every day in the lives of researchers where individuals are always questioning and evolving their views and efforts.

Future Goals:

I plan to pursue an advanced degree in mechanical engineering at Georgia Tech so that I am best prepared to apply my knowledge and skills to the fields of robotics, alternative energy, and machine design. Obtaining this degree in mechanical engineering will allow me to better focus my creative and analytical skills and apply them more effectively. Ultimately, I hope to be a greater resource to the world that we live in as I endeavor to pursue my passion of creating devices optimized for answering the needs of consumers and everyday people.

University of Michigan
Ann Arbor, MI
B.S. Aerospace Engineering, May 2012

NASA Academy Research Project:
Developing a Photolithography Process for Si_3Ni_4 Etching

Principal Investigator:
Dr. Sheila Bailey

Hometown:
Grand Rapids, MI

EMAIL: ngmckay@umich.edu

Personal Statement

I wanted to be part of the NASA Glenn Academy because I felt the experience I would gain as a research assistant will be invaluable as I progress my way through college and eventually seek a career in the aerospace industry. As part of this program I am approaching and solving real world aerospace engineering problems. This problem solving practice will improve my work habits and teach me what skills I need to improve on as I prepare myself for a career.

I want to work at NASA due to my overwhelming interest in space exploration. One of my life goals is to gain a career that allows me to contribute to the human exploration of space. I believe that exploring space is extremely important. Without first exploring, we humans will never be able to understand our place in this ever expanding universe. Is there other live out there? Can we colonize another world? What important things can we learn of our own planet? The need to study space and provide a scientific answer to this question motivates me to achieve a career that allows me to contribute. I would like to do my part as an engineer to help in the numerous efforts of NASA. I can think of nothing more rewarding then having one of my ideas develop into a critical aspect of real spacecraft.

My past research experience in the Sih optics lab at the University of Michigan was very beneficial. This experience exposed me to the world of research and allowed me to take on responsibility early in my college career. I became more confident in making decisions and more comfortable asking for help. This research experience taught me how to use a plethora of lab equipment and how to go about designing precision parts.

Currently I am involved with a student run engineering group at the University of Michigan called the Student Space Systems Fabrication Laboratory (S3FL). I am working on the XSAS team, designing an apparatus test the eXtendable Solar Array System (XSAS) in a microgravity environment as part of NASA's Reduced Gravity Student Flight Opportunities Program. XSAS is a solar array system intended to be used by cube satellites to increase their available power. Working on XSAS gives me engineering experience designing, performing trade studies, and building components. I hope to gain a leadership role next year and continue my work on the XSAS team. I also plan to pursue a Masters Degree in Space Engineering at the University of Michigan.

Leadership

During my freshmen year I took an introductory engineering course in space systems design intended to expose students to engineering principles and technical communication. For the final design project we were tasked with designing and building a remote control blimp capable of performing surveillance mission (as if it were an earth-based prototype for a Martian mission). While the team atmosphere was very casual, I did assume a leadership role within the group. I would initiate the delegating of work, set up meeting times, reserve lab space and equipment for our work, and do my best to resolve disputes about the design. I feel that, in addition to the professionalism of my peers, my initiative to step up as a leader and make decisions helped in the timely completion and mission success of our blimp.

Ryan Miller

SUNY Buffalo
Buffalo, NY
B.S. Aerospace Engineering, May 2009

Purdue University
West Lafayette, IN
M.S. Aeronautics and Astronautics, May 2011

NASA Academy Research Project:
Design Optimization of a Next Generation Supersonic Transport

Principal Investigator:
Dr. Meng-Sing Liou

Hometown:
East Aurora, NY

EMAIL: ryan.p.miller@nasa.gov
mille493@purdue.edu

Personal Statement

Since I was very young, I have dreamed of and desired a civilization that extends into the far reaches of space. Pictures of distant galaxies or enchanting nebulae and staring up into the night sky stir up a longing within me to travel to and reach those places. It is my life's goal to help make space travel more affordable, convenient, efficient, and faster so that this dream of a civilization that spans throughout space can become a reality.

I applied for a NASA internship because I would love to learn more about the space industry and to have the opportunity to work on a project related to aerospace technology. I hope to one day work on a project that involves some of the more advanced developments in propulsion, such as nuclear propulsion, electromagnetic propulsion or the VASIMR project, as work on these projects would contribute to more affordable, efficient, and faster methods of space travel. I am excited to work on my current research project with Glenn's Aeropropulsion Division, as the design methods and computational techniques that I will learn and use for this project are directly applicable to any career in the space industry.

My strong and diverse academic background, research, and work experiences have made me an invaluable asset at NASA Academy. My nearly perfect undergraduate GPA and 4.0 graduate GPA exemplify my dedication to success and attest to my rigorous work ethic. My motivation and insatiable curiosity have lead me to study abroad twice and pursue activities outside the classroom. Participating in the study abroad programs has enhanced my knowledge and understanding of the world, developed my communication skills, and has made me more resourceful and independent. My experience as a teaching assistant has further enhanced my professional skills. I have also undertaken two undergraduate research projects, one of which was a part of my most recent study abroad program in Toulouse, France. These experiences have further developed my analytical and computer skills.

After achieving a Masters degree, I intend to continue on to a PhD in propulsion at Purdue. I would like to pursue a career in developing and improving propulsion methods at NASA or a related company. I believe that it is possible to develop a method of space transportation that would allow travel to Mars to take less than a month in less than a lifetime. Contributing to such an advancement is an endeavor that I would most readily commit my life to, as traveling to Mars myself is one of my strongest desires. This NASA internship will be an invaluable experience for a future career in the space industry, as I would one day like to work at NASA or related company.

Leadership

For my MAE 277 class (Introduction to Mechanical and Aerospace Engineering Practice), I worked on a group project that involved taking apart and analyzing a Weed Eater line trimmer, an oral presentation, and a technical report. The original group leader showed little responsibility or initiative at first and other group members seemed reluctant to proceed with the project. A week or two went by with little progress, which made me concerned. I then took the initiative to contact all my group members and organized group meetings. It quickly became apparent that the other group members looked to me for what needed to be done. I then learned to delegate responsibilities and tasks based on my group member's interests. The quality and amount of work that I was putting into the project, in conjunction with my high expectations, yielded quality work from all group members. In the final weeks, the group meetings became very organized and incredibly efficient. In the end, we put together a presentation which I presented to a class of 150-200 and it received a grade of 95 %. The technical report on the line trimmer was 70 pages in length, complete with assembly/disassembly instructions, part descriptions, and ProE assembly drawings (received a grade of 97 %).\

Additionally, leadership responsibilities come with my Black Belt in Karate. As a Black Belt, I served as a role model to other students in the school and was required to run warm ups, drills and class instruction.

Kylee Underwood

West Virginia University
Morgantown, WV
B.S. Physics and Mathematics, May 2010
M.S. Physics, May 2012

NASA Academy Research Project:
Solar Power for Solar Probe

Principal Investigator:
Geoffrey Landis

Hometown:
Glenville, WV

EMAIL: munderwo@mix.wvu.edu

Personal Statement

The first time I experienced NASA was through a gifted education program in elementary school. Our instructor brought in a model space shuttle printed on card stock. I remember as a second grader cutting around the perimeter as carefully as I could. I scored the fold lines with scissors and tried to work with the utmost precision. Later that year we watched a space shuttle lift-off live on TV. I was enamored! In fifth grade, I took a course through the same program about space. For fun we learned about some of the training activities that the astronauts went through, and mimicked them ourselves. That year for my birthday, my parents signed me up to go on a day mission with the Challenger Learning Center in Wheeling. It was the highlight of my life for the longest time afterward! During elementary school, I emailed NASA consistently, asking for educational materials, pictures, information, anything they had about their programs. I am surprised that they kept answering my emails and sending materials! I remember how excited I always was to receive mail from NASA and how it came in strong, soft, and thin white paper envelopes.

As a young scientist, I have become very interested in the simulation aspect of science and its predictive nature. I enjoy programming simulations as it is exciting to see how a series of simple algorithms can come together to explain physical principles that would otherwise be difficult to understand. For this reason, I am pursing a PhD in an area of computational physics. Though I am interested in solid state physics, I find simulation work in general interesting and have a strong desire to keep an open mind about my work and explore many different areas in which simulations can be used as a tool.

With two computational research experiences under my belt, I am convinced that this is what I love to do. I have only started on my lifelong adventure of learning and discovering, and I could not be more excited about what lies ahead. My future plans are

to become a flexible part of the solution and help to solve the crucial problems of the world as they arise. Whether that takes me further into academy, industry, government, or a mix of all, I have yet to discover.

As I have gotten older, I have followed the advice I received from NASA: take lots of math and science; enjoy it; try to excel in it! I am very proud to be an honors graduate with degrees in both math and physics. I am also very honored to be a recipient of a NASA Undergraduate Research Fellowship from the state consortium. Attending NASA Academy is both a huge honor for me and a step towards bringing my childhood dream to fruition.

Interests

As much as I enjoy science and research, I have many outside interests. Through high school I performed in three choirs and was a member of 2 state choirs. I participated in forensic speech competitions, four school plays, and multiple county-wide writing competitions. Although I chose to study science and math in college, I still try to find creative outlets both inside and outside of my field and enjoy fiddling with a guitar, singing, participating in educational outreach and giving presentations as a direct result.

Most of my other interests revolve around my love for the outdoors. Camping and climbing, I have found are great ways to spend free weekends. I recently received a hiking pack as a gift and I am really looking forward to planning my first backpacking trip this fall. I would love to one day attempt to hike the Appalachian Trail from start to finish. My passion for nature is also a drive for my research. I would like to contribute to technologies that will help preserve our world so that it can continue to be a playground for many generations to come.

The Importance of Outreach

It is clear from my personal statement that I was recruited into the field of science from a very early age. I was excited by the possibilities presented to me through my teachers, science centers, and other outreach. In this time of great competition from countries around the world, it is essential that we continue to excite the imaginations of future generations. As science continues to advance, more and more questions become necessary to explore. For the future of this nation and the world, we need to raise our children up to be able to answer these questions. These naturally curious beings must, however, be aware of the possibilities in front of them and the achievability of their dreams. Through outreach to them, I want to enable children to grow up reaching for the moon, Mars, Titan, and beyond.

Tuskegee University
Tuskegee, AL
B.S. Chemical Engineering, May 2010

NASA Academy Research Project:
Biofuels as an Alternative Fuel Source for Aviation

Principal Investigator:
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Personal Statement

My interest in the NASA Glenn Academy is the Space Processes and Experiments Division. During the summer of 2009, I was a participant in the NASA Science and Technology Institute (NSTI) at NASA Glenn Research Center. The research I performed was within the Space Processes and Experiments Division; producing biodiesel fuel. The title of my research was "Analysis of Salt Tolerant Plants and Algae: *Extraction and Characterization of Lipids from Chaetomorpha and Halophytes for More Efficient Jet Fuel*". The purpose of this project was to determine the percent yield of extracted lipids from salt water plants in order to determine the feasibility of efficiently producing transportation fuel. Both leaves and seeds from plants as well as algae biomass were studied. Three species were characterized: *Salicornia*, *Chaetomorpha*, and *Codium*. For the plant leaves and algae biomass, acid-catalyzed transesterification was used, and for the plant seeds, base-catalyzed transesterification was used. Transesterification is the process of converting a larger ester into a smaller ester with the same hydrocarbon chain on one side of the ester. It can be used as a step for the analysis of the hydrocarbon chain. The resultant methyl esters were then characterized using Gas Chromatography/Mass Spectroscopy.

I had not given biofuels a thought until I had experience producing it. It is, in fact, becoming a very important research field for the reason of global warming. It is becoming increasingly difficult to find oil reserves. Meanwhile, the demand for oil is increasing. What's oil used for? Its main use is to provide fuel for the vehicles that we drive on a daily basis. Unfortunately, when these fuels are burned, they emit carbon dioxide which causes global warming. Therefore, the two problems are that the desired quantity of oil is becoming more difficult to obtain, and when it is burned it brings about

global warming. I intend on developing a fuel that is not only safe to the environment, but also has many resources in the developmental efforts.

Currently, as a Research Associate in the NASA Glenn Academy, my focus is on climate adaptation on fresh and salt water algae and halophytes. In the past, algae has been said to have the most lipid extract. The goal is to test the percent extract on each species of algae and halophytes to determine which would be more efficient to use as aviation fuel in the future. My plan after the summer is to attend graduate school and possibly research more and collaborate with others who have and are now studying the production and safety of the use of the surrogate jet fuel.

Leadership

Along with the community service projects performed, I have been responsible for activities involving the Department of Human Resources such as sponsoring families for Thanksgiving and Christmas to those unfortunate families. As a member of Zeta Phi Beta Sorority, Incorporated, I recently held the office of Parliamentarian. Outside of the sorority my interest has been to establish a relationship with the Jerusalem House, a home providing support and permanent housing to adults suffering from homelessness and HIV/AIDS. During the time, volunteering services included the assistance of program development and being there to prepare monthly meals. Also, as a member of Omega Chi Epsilon, the Chemical Engineering Honor's Society, my colleagues and I held tutorial sessions for underclass chemical engineering students. In addition, I am a NASA Student Ambassador. Within this prestigious community, I have the opportunity to participate in panels, network, and be a mentor to NASA interns and others in school.

Hobbies

Singing, I do all the time, but during my free time I love to play basketball and possibly participate in softball. I have always been an athlete. Even though I can't swim yet, it's very thrilling to go inner tube surfing. Community service activities are always a good way to enjoy myself and relax; painting houses, playing bingo with the elderly, etc. Most of the community service is done within my sorority.

Acknowledgements

I would like to show my gratitude to Dr. Deidre Paris-Michael for supporting me throughout my undergrad years and for introducing me to the NASA community along with the United Negro College Fund Special Programs Corporation and the NASA Science and Technology Institute (NSTI). A special thanks goes to Dr. Michael J. Kulis for the mentorship and guidance provided. I would also like to thank Dr. M. David Kankam and Dr. Bilal Bomani for the opportunity to illustrate my abilities within the NASA Academy.

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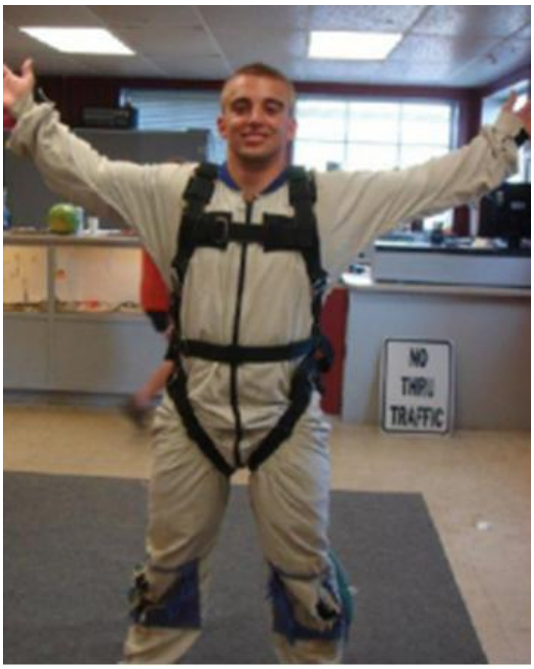

Philosophy

The following is an excerpt from the National Aeronautics and Space Act of 1958 (the act signed by former President Eisenhower which officially created NASA as a government agency):

> *The aeronautical and space activities of the United States shall be conducted so as to contribute materially to one or more of the following objectives:*
>
> - *The development and operation of vehicles capable of carrying instruments, equipment, supplies and living organisms through space*
> - *The preservation of the role of the United States as a leader in aeronautical and space science and technology*

NASA was founded in 1958 to "expand the space frontier". Throughout the Mercury, Gemini, Apollo, and (for the most part) the Shuttle program, NASA has firmly stuck to its roots and tried to expand the frontier. Many scientists and engineers, including myself, start a career because of the discoveries made by NASA scientists, engineers, and astronauts. I try to shape my career on the same principles that NASA was founded in 1958: to do things that no one has done or thought of as well as going where no one has gone before.

Work Experience, Research, and Hobbies

My first experience in the aerospace industry was an internship during May 2007 at ATK in Dayton, OH. I got a first-hand look at how a private company conducts research. I was working in a radar group to create a more efficient R-card coating process for the radar cross-section on the B-2 bomber. During my second week at ATK, the Massachusetts Space Grant told me that I had been accepted into NASA Academy.

However, the director of MSFC NASA Academy told me that all the slots had been filled. Luckily, one of the students dropped out 3 days prior to the start of the academy, so I happily stepped into that slot and moved to Huntsville, Alabama on the flip of a card.

During the remainder of summer 2007, I was a Research Associate for Dr Ed West on SUMI, which is a project to map the magnetic field of the sun. My particular job was controlling the detectors for one of the four cameras on the sounding rocket. I worked with LabView to get the detector ready for testing in the vacuum chamber. I returned to NASA Academy at MSFC as the Operations Manager in the summer of 2009.

I completed two design projects while at WPI. My summer 2008 was filled with biofuel research at WPI. I partnered with Dr Reeta Prusty Rao and one other student to conduct a study of biofuel production in Brazil which meets its gasoline demand through the production of ethanol from its sugarcane crop. This study included the chemistry and biology of ethanol production as well as the economics and politics. Finally, the study concluded with a proposal which the US could implement to eliminate some of its petroleum-based gasoline with ethanol made from switch grass or corn. My senior design project involved two fluid processes: flow focusing and electrospray. I worked with Dr John Blandino and two other students to combine these two processes in one apparatus. Our group built the proposed design and conducted some initial testing of the two processes.

Most of my hobbies have always included athletic activities. I was involved with athletics as early as three years old while playing on a basketball team as early as seven. I continued to be involved with athletics through college as I spent my final two years playing football for WPI. Outside of athletics, I am a certified scuba diver and attended Toastmasters public speaking meetings for three years of college.

Educational and Professional Objectives

My experience with the NASA Academy in 2007 made me realize that I want a future in the aerospace industry. I initially chose Aerospace Engineering for my undergraduate degree but soon understood that I could double major in Physics and graduate in four years. After working as the Operations Manager for NASA Academy at Marshall Space Flight Center in the summer of 2009, I realized that I enjoy the management aspect of research as much as the science. Therefore, I returned to NASA as the Operations Manager for Glenn Research Center.

My professional goals have always included joining the astronaut corps. However, I have discovered that, in recent years, politics plays more of a role in manned space flight than it should. Therefore, my career goal is the continuation the manned space flight program for America to places where no one else has gone before. For me, this can be achieved through joining the astronaut corps, being the NASA administrator, or the leader of a private corporation. To reach this career goal, my education will not stop with a Masters in Mechanical Engineering at Vanderbilt. I am uncertain whether my next degree is a PhD, an MBA, or another Masters.

Dr. M. David Kankam

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Dr. Kankam joined the NASA Glenn Research Center (GRC) in March '90, as a Senior Research Engineer in the 'Power and On-Board Propulsion Technology Division'. He currently serves as the GRC University Affairs Officer at GRC. He has oversight responsibility for GRC research community collaboration with academia, in support of the Center research programs. He also currently serves on the Research Advisory Boards of Cleveland State University, Miami University in Ohio, and the Puerto Rico Space Grant Advisory Board in Puerto Rico.

Dr. Kankam earned his Diploma in Business Admin. (Mgt. Studies), and Ph.D., M.A.Sc. and B.A.Sc. (Applied Science & Engineering) degrees in Electrical Engineering from the U. of Toronto, Canada. He is a member of the Canadian Society of Professional Engineers, and a Life Senior Member of the IEEE and its Industry Application Society (IAS). He served as the 2005 and 2006 chairman of the Industrial Automation and Control Committee of the IEEE/IAS, and is now the Vice-Chair of the Manufacturing Systems Development and Applications Department of the IEEE/IAS, for Magazine publications.

Dr. Kankam was a Research Officer in the R/D Division-Ontario Ministry of Transportation & Communications (MTC), Toronto/Canada, from Dec.'73 to Aug.'77. He was then employed as an Engineer at Ontario Hydro, Toronto/Canada, from Sept.'77 to Feb.'79, and an Application Engineer at General Electric Company in Schenectady, NY, from March '79 to March '90.

He served on the GRC's Fellowship Selection Committee for several years, Technical Review Teams, Panel of Evaluators for NASA Research and Internship Programs, and as GRC's Technical Representative of NASA 'Faculty Awards for

Research' Program from '92 to '97. He has proctored and mentored summer Faculty Fellows and Student Interns, respectively, to complement in-house research programs. He was selected as a NASA Administrator Fellow from '97 to '99. During the '97-'98 academic year he was a Visiting Professor in the Dept. of Electrical Engineering, Howard Univ., in Washington D.C., where he taught "Energy Conversion", and co-developed the "Automation and Control Laboratory." Subsequently, he was a Study Director at the National Research Council's Aeronautics and Space Engineering Board, and later as a Visiting Research Engineer at the Royal Military College of Science in Shrivenham, England.

He was appointed Acting Chief of the 'Electro-Mechanical Systems Branch' from November 2000 to March 2001. Later, he served as a Strategic Planning Manager in the Aeropropulsion Research Program Office, in support of Aerospace Propulsion and Power Programs. As a former senior research engineer, he planned and performed research, and managed, identified and consulted on the development of power and power electronics-based systems for aerospace and terrestrial applications. He has authored/co-authored over fifty technical reports, and more than sixty refereed publications on the dynamics and control of power and power electronics-based systems, in IEEE Transactions, Conference Proceedings and affiliated Journals.

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Special Thanks To:

The Ohio Aerospace Institute (OAI)

Bernice Beznoska – NASA Glenn

Kim Tanger – OAI